

- Title

Multi-wavelength observations of small brightening events in the chromosphere-TR-corona and their magnetic properties

- abstract of observational proposal

Small-scale transient brightenings occur frequently in the solar atmosphere. Shimizu (1995)'s research with Yohkoh Soft X-ray Telescope shows that the frequency distribution of microflares are represented by a power-law function and their total energy, assuming that the power-law continues to lower energy, is smaller than the heating rate required for the active-region corona. However, much smaller energy release events, such as UV transient brightenings, explosive events and blinkers, have been observed in UV with higher occurrence rate (Aschwanden et al. 2000 for a frequency distribution plot of these events).. Therefore, We need to evaluate the energy and frequency of these events with multi-wavelength observations that provide properties of plasma in chromospheric, transition-region and coronal temperatures.

Quantitative high-cadence measurements of magnetic fields are also crucial to understand physical mechanisms on driving these small events. The combination of Hinode's SOT, EIS and XRT makes it possible to investigate the driving mechanisms as well as their coronal and chromospheric responses. Further, IRIS gives us not only high-resolution spectra which are sensitive to the transition-region temperature plasma, but also Mg II triplet lines, which is sensitive to the relatively cool plasma (Pereira et al 2015) and useful for diagnosing the small-scale brightenings.

This proposal is to coordinate Hinode's three telescopes with IRIS for acquiring simultaneous datasets suitable for studying small brightening events.. Note that the data will be used in the proposer's Master-thesis studies.

- request to SOT

-SOT/SP-

Fast map (1cycle exposure, 2x2 summed)

18"x 60.9" (124 slitpos and 2.5 min cadence)

Q=65, 1-side CCD

-SOT/FG-

Ca II H: 18.7"x74.6", 2x2 summed, Q=65, 80ms exposure, 32sec cadence

G-band: 18.7"x74.6", 2x2 summed, Q=65, 80ms exposure, 32sec cadence

Na D Sh-less IV +140mÅ: 30.7"x81.9", 2x2 summed, Q=65 for I and 95 for QUV, 8cycles exposure, 32sec cadence

SOT total data volume is about 0.75Gbits per an hour.

- request to XRT

FILTER: Al-poly/open, thin-Be/open, open/Al-mesh and several G-band images for coalignment

FOV: 128"x128"

RESOLUTION: 1"x1"

CADENCE: 60sec

EXPOSURE TIME: AEC enable

XRT total data volume is about 150Mbits per an hour.

- request to EIS

Study ID: 134

Raster ID: 111

Raster type: Scanning

Number of pointing positions: 20

Scan step size: 2"

Window height: 120"

Exposure times: 10000ms

Number of window: 21

OIV 184.10, Fe VII 185.21, Fe XI 188.23, Ca XVII 192.82, Fe XII 195.12, Fe XIII 203.83, O V 248.46, He II 256.32, Si X 258.37, Si X 261.04, Fe XVI 262.98, Fe XXIII 263.76, Fe XIV 264.78, Mg VI 269.17, Fe XIV 274.20, Si VII 275.35, Mg V 276.57, Mg VII 278.39, Mg VII 280.75, Fe XV 284.16

EIS total data volume is about 0.2Gbits per an hour.

- other participating instruments

-IRIS-

Basic raster type: Large sparse 16-step raster (FOV:15"x120")

SJI choices: C II, Si IV, Mg II h/k, Mg II w

Exposure times: 1 sec exposure

Summing modes: Spatial x 2 Spectral x 2

FUV summing modes: FUV spectrally rebinned x 4

SJI cadence: SJI cadence ~ 10s

Compression choices: Default compression

Linelists: Large Linelist

Slit orientation: No rotation

OBSID: 3800600036

- remarks

Duration of program run is 3 hours in minimum. We hope to take one dataset soon after 10 August (end of visible-light eclipse) for the proposer's master thesis analysis.

-Target of interest-

1. Active regions with emerging activities

2. Moat region of a well-developed sunspot

Targets should be located ± 30 deg in heliocentric coordinate.

- List of past HOPs in which the present proposer was the PI

IHOP271

A run was performed very recently (on June 18th). The proposer recently started to analyze the data and will present the results in the M-thesis and other opportunities.